

# scope

WINTER 2007

A LOOK INSIDE THE COLLEGE OF PHYSICAL

AND MATHEMATICAL SCIENCES



## Who's educating our students?

The key to a quality education is quality faculty.  
Learn what it takes to succeed in today's  
competitive higher education environment.

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### On the cover:

PAMS faculty members appearing on the cover are **(front row)** Kimberly Weems, Statistics; Lin He, Chemistry; Prabha Ramakrishnan, Physics; Dave Dickey, Statistics; **(back row)** Karen Daniels, Physics; Chuck Boss, Chemistry; Michael Shearer, Mathematics; Mette Olufsen, Mathematics; Fred Semazzi, Marine, Earth and Atmospheric Sciences. Photo by Roger Winstead.

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# Our students learn from the best



PHOTO BY ROGER WINSTEAD

Dean Daniel L. Solomon

I do a lot of bragging about our faculty—their work ethic, their dedication to students, their insatiable curiosity, and their passion for discovery. These traits are an inspiration to our students, firing their imaginations and opening them to see with new eyes.

Most of us can think back to our own college days and remember specific faculty members who had an impact on how we saw our disciplines, our world, or even ourselves. I remember vividly a brief conversation that I had with a professor when I was an undergraduate that literally changed the direction of my life.

But in today's higher education environment, what does it really take to succeed as a faculty member?

There's an all-too-common, but inaccurate, perception that faculty leisurely teach one or two classes a day and then go home. This is a myth.

First, faculty have multiple roles in a university such as NC State. And while the teaching function remains primary, what happens in the classroom is only one dimension of that function. Faculty "teach" in their roles as advisors to undergraduates and in their laboratories as supervisors of the research of graduate students and postdoctoral associates.

Even for the classroom, each class session requires preparation, and material must be updated from semester to semester to reflect new knowledge or innovations in teaching methods. Office hours and e-mail exchanges are devoted to helping individual students with their learning. Papers and tests must be graded and recorded. Electronic homework and grading systems as well as graduate teaching assistants must be managed.

Most faculty also engage in research. In this capacity, they must manage research enterprises which often include teams of graduate and undergraduate students, postdoctoral associates and perhaps other staff—providing mentorship to ensure that their students develop the research and people skills they'll need after leaving the university. They also must navigate the complex, competitive funding environment, submitting proposal after proposal to obtain sufficient funds for their equipment,

supplies, graduate student stipends and other related expenses. While some faculty conduct their research at a computer, others manage sophisticated laboratories, while still others travel to field sites that span the globe.

Some faculty also engage in formal programs of outreach and public service, taking the fruits of our research into the public arena to improve our schools, enhance our economy, protect our environment, or inform public policy decisions.

And then there are other duties—service on committees or as coordinators of special programs at the department, college or even university level. Undergraduate and graduate program directors, for example, manage the recruitment and monitor the progress of all students in their department. Other faculty play key roles in curricular revisions or university-wide faculty governance.

Additionally, because we are charged with the great responsibility of providing core science and math courses for students from across the entire university, we teach over 20 percent of the university's total credit hours—and we do so with about 12 percent of the university's faculty.

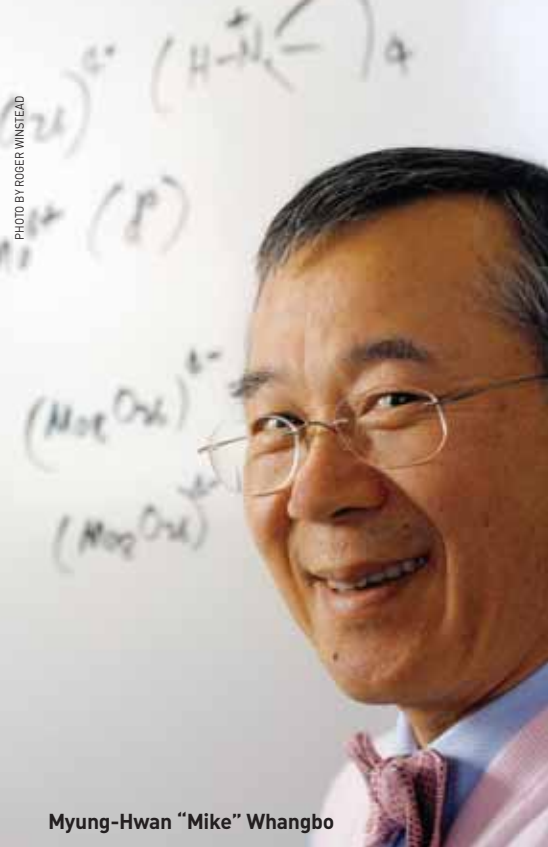
It takes a special person to do all this—and our College has some 200 of these special people.

In this issue of Scope, we pay tribute to our faculty. In addition to our regular mix of news, we've included some stories that highlight our faculty's achievements, explain some of our challenges, and hopefully give you a better sense of the faculty member's role in higher education today.

I am very proud that our students are being taught by this talented group of professionals. After learning a bit more about them, I'm sure you will be, too.

*Daniel L. Solomon*

Daniel L. Solomon, Dean



Myung-Hwan "Mike" Whangbo

## Notables

**Robert Beichner** (Physics faculty)—George B. Pegram Award for Excellence in the Teaching of Physics in the Southeast, American Physical Society, Southeast Section

**Dean "DJ" Connor** (MS '03, PhD '06 Physics)—R&D 100 Award, *R&D Magazine*

**Marie Davidian** (Statistics faculty)—Fellow, Institute of Mathematical Statistics and Fellow, American Association for the Advancement of Science

**Subhashis Ghosal** (Statistics faculty)—Fellow, Institute of Mathematical Statistics

**Marcia Gumpertz** (Statistics faculty)—Fellow, American Statistical Association

**Dan McCaffrey** (PhD '91 Statistics)—Fellow, American Statistical Association

**Matthew Parker** (MEAS faculty)—National Science Foundation Faculty Early Career Development (CAREER) Award

**William Waters** (Emeritus Mathematics faculty)—W.W. Ranking Award for outstanding contributions to mathematics education, North Carolina Council of Teachers of Mathematics

**Myung-Hwan "Mike" Whangbo** (Chemistry faculty)—Docteur Honoris Causa, Université de Nantes, Nantes, France □

## New scholarships celebrated with signing ceremonies

When donors step forward to establish endowments, they have the option of allowing the College to honor their gift through a *signing ceremony*.

These events allow the College to express gratitude on behalf of its students and faculty, and allow the donor to share the reasons and motivation behind the gift. Quite often, the event becomes a small, very personal reunion, of sorts.

"Endowments provide permanent sources of support for PAMS students and its programs," said Denise Hubbard, director of development for PAMS. "Simply saying 'thank you' seems inadequate, so we've introduced the signing ceremonies to provide an exchange of sentiments more suited for these very special gifts."

Three signing ceremonies were held recently.

Tom Rhodes, a '65 applied mathematics graduate, recently established the Thomas and Bonnie Rhodes Scholarship, partly to memorialize his wife, who passed away in 2005. He is retired from Wachovia as vice president of automation and serves as a member of the PAMS Foundation board of directors.

The Rhodes signing ceremony was held in a private box in Vaughn Towers at Carter-Finley Stadium just before an NC State football game. Terry Wood, vice chancellor for development, visited the box for the ceremony,

which was attended by College representatives, invited guests and the Rhodes' children and their spouses.

Vi Rigney and her children together established the Dr. Jackson A. and Viola H. Rigney Scholarship. Jack Rigney is fondly remembered as a faculty member and head of the Statistics Department, interim chancellor and dean of international programs.

The Rigney signing ceremony was a private gathering, attended by a small group of College friends. One daughter flew all the way from California to attend. Much time was spent with leisurely recollections about Jack, stories from his teaching days, Vi's partnership in his work, and the many happy years they shared.

John Seely earned his BS in physics in 1968, and works at the Naval Research Laboratory in Washington, D.C. He opted to sign his endowment at Vaughn Towers during halftime of a football game, with his mother present. She watched proudly as her son signed documents establishing the Lucille Joyner Seely Scholarship in her honor.

"These events really are very personal and allow the donors to express a lot of thoughts about their gift, the person they are honoring by the gift, what they hope the gift will accomplish, and how they feel about NC State," Hubbard said. "This has been a rewarding addition to our program for all involved." □



Dean Dan Solomon, Vice Chancellor Terry Wood, Lucille Seely and John Seely pause for a photo at the signing ceremony establishing the Lucille Joyner Seely Scholarship endowment.





PHOTO BY SALLY RAMEY

# What's in a name?

## *How students benefit from faculty reputation*

As the saying goes, you were under a rock if you didn't hear about the debate over Pluto's planetary status that dominated the International Astronomical Union's (IAU) conference held this summer in Prague, Czech Republic.

Unfortunately, the debate overshadowed another important IAU discussion marking the 1,000th anniversary of the brightest documented supernova ever seen from Earth.

Observed and documented by several ancient societies, the supernova of 1006 left a remnant that is one of the most studied remains of a supernova today.

"It was so bright, it was visible during the daytime," said Stephen Reynolds, a professor of astrophysics in the NC State Physics Department. "It was as bright as the quarter moon, and cast shadows at night. This is impressive when you consider that all of that light came from a just small point in the sky."

Reynolds was one of only five scientists invited to speak, and appear at a news conference, about the supernova at the IAU conference – a great honor considering that the IAU

has almost 9,000 members in 85 countries. He was invited to speak on the same subject at an event in Japan in December.

"Our faculty includes a large number of individuals who are considered experts on a

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*Ray Fornes*

national and even international level," said Ray Fornes, associate dean for research in the College of Physical and Mathematical Sciences. "Their reputations enhance the reputation of the College and of NC State."

In higher education, reputation speaks volumes about the quality of an institution's programs. Talented, dedicated faculty members produce quality programs. In turn, quality programs provide a quality educational experience for students at all levels.

"We want our students to learn from the best," Fornes said. "This enhances their education by immersing them in cutting-edge science and exposing them to role models who can instill in them the skills and drive to succeed. This experience strengthens their degrees and gives them a competitive edge when seeking employment or pursuing higher degrees."

It is well known that a degree in a specific field is more impressive when received from an institution known for an outstanding program in that field.

"For example, a statistics degree from NC State carries a lot of weight because of the

**(left)** An energetic lecturer, chemist Jim Martin describes his groundbreaking discoveries about liquid crystalline structure to participants in the PAMS Alumni & Friends Weekend.

reputation of our program,” Fornes said.

Students are not the only beneficiary of a quality program. Innovations and discoveries made at NC State fuel the economic engines of North Carolina and the nation. As the global economy becomes more competitive, it is vital to the state, and to the nation, that our universities retain their status as the best in the world.

However, such a reputation must be earned and maintained, and the key to that is faculty.

When the College was founded in 1960, its focus was primarily providing core science and mathematics courses for the university’s entire student body. This was an important responsibility, and still is today.

However, over the following decades, the College began to enhance its programs and reputation in research and graduate education. This required an investment in research infrastructure and hiring innovative research and teaching faculty.

“Today, we are a major research enterprise, and very different from the PAMS of even 15 years ago,” said Fornes. “Our programs are now ranked with the best, our students—both majors and non-majors—are receiving a much richer educational experience than ever before,

PHOTO BY SALLY RAMEY



**Marco Bongiorno-Nardelli of Physics** has repeatedly made news in the last few years with his work in nanoscience, including carbon nanotubes.



PHOTO BY SALLY RAMEY

**Montserrat “Montse” Fuentes of the Statistics Department** specializes in environmental and spatial statistics. She works closely with the atmospheric modeling division of the Environmental Protection Agency in Research Triangle Park.

and NC State is making significant contributions to science, the economy, the environment and the human condition.”

There are challenges to maintaining the momentum, however—other universities have the same idea.

“We face real challenges in recruitment and retention of quality faculty,” said Fornes. “Bringing a laboratory researcher to NC State can cost upwards of \$1 million because of their equipment and facility needs. Salaries have become much more competitive, and our faculty members are constantly recruited by other institutions.”

This puts an additional strain on already-stressed budgets.

“This is the reason professorships are a key goal in the College’s portion of the Achieve! Campaign for NC State,” Fornes said. “We compete against the nation’s wealthiest universities when it comes to hiring, and keeping, our faculty.”

The investment is critical to maintaining the standard the College has set for the quality of educational experience provided to its students.

“We can’t rest on our laurels,” said Fornes. “We must continue to achieve.” □

**“Our students — both majors and non-majors — are receiving a much richer educational experience than ever before.”**

*Ray Fornes*



# NC State receives \$1.5 million to improve science education

Get out of the classroom and do real science. That's the idea behind NC State's new \$1.5 million grant from the Howard Hughes Medical Institute (HHMI). The grant aims to improve science education through bold and creative initiatives that instill a passion for science in students of all ages.

David Haase, professor of physics and director of The Science House, and Thurman Grove, professor of zoology, said the grant's three components will afford NC State students—and students from traditionally underserved northeastern North Carolina—hands-on experiences with science.

That's important, the professors say, because opportunities to delve into scientific concepts—learning by doing science rather than passively accepting lecture materials—will help create the scientists of tomorrow.

"The HHMI program is one way NC State builds innovation in teaching and learning, and brings those innovations to K-12 students. This grant will affect the teaching of introductory biology, bring more undergraduates into research labs, and introduce rural students to inquiry-based learning," Haase said. "NC

State is one of the few universities to have received four HHMI grants. This has been a great partnership for the colleges of Physical and Mathematical Sciences (PAMS) and Agriculture and Life Sciences."

The first component of the grant calls for the development of a new introductory biology course for non-science majors at NC State.

tidisciplinary scientific issues such as genetic engineering, evolution and cloning. The course should provide an understanding of the scientific method and the relevance of science to about 1,000 students annually.

The grant also expands undergraduate research opportunities at NC State. Through the Reaching Incoming Student Enrichment

**"This grant will affect the teaching of introductory biology, bring more undergraduates into research labs, and introduce rural students to inquiry-based learning."**

*David Haase*

With a goal of ensuring that citizens are better informed about biological concepts and based on hands-on experiments and problem solving, the course will focus on timely, mul-

(RISE) program, eight first-year students will receive the opportunity to have a summer research experience at the university before their classes begin in August. In addition, 10 of NC State's best and brightest will conduct research during their junior and senior years.

The grant also will make an impact on the K-12 population outside the university's walls. Through The Science House, PAMS' science and math outreach arm that utilizes demonstrations, student camps, teacher workshops and innovative lab training, students and teachers from four high schools in four counties will continue the Bennett's Millpond Environmental Learning Project near Edenton in Chowan County.

Judy Day, Howard Hughes science exploration and outreach program coordinator for The Science House, and who has coordinated multiple HHMI grant projects, said the Bennett's Millpond project—in which soil composition, water quality and aquatic flora and fauna of this coastal swamp are studied—brings science to life for both students and teachers.

"These high school students and their teachers show excitement for research that is right in their back yards, and the project gives them ownership of it," Day said. "The project integrates math and science and allows the participants to become experts in an area of



COURTESY OF THE SCIENCE HOUSE

**Students participating in The Science House's photonics program are making a light guide to compare the index of refraction of light in three mediums of air, water and glycerin. This helps them develop a deeper understanding of fiber optics, transmission of information by light, and the advantages of this form of communication.**





COURTESY OF THE SCIENCE HOUSE

These teachers are working through a lab activity, "Parts Per Million," at a Science House workshop called Environmental Science Hands-On Inquiry Based Activities.

their choosing. Students have even written grants and received funding for project proposals like Bennett's Millpond Appreciation Day, which they designed in order to build community environmental awareness."

HHMI—a nonprofit medical research organization that is the nation's largest private supporter of science education—is investing \$86.4 million to support programs at 50 universities

this year. HHMI invited 214 research universities with a proven track record in preparing students for graduate education and careers in research, teaching or medicine to compete for the undergraduate science education awards. The institute received 158 applications. A panel composed of leading scientists and educators, including HHMI professors and an HHMI investigator, reviewed the applications. □

## New match supports Science House

Although it's a proven program, The Science House is primarily dependent on competitive grants to maintain its funding.

To provide a source of permanent funding, an anonymous donor introduced a matching program of up to \$250,000 in endowment two years ago. Many alumni and friends took advantage of the match, and established endowments supporting The Science House totaling \$500,000.

In a follow-up to this successful challenge, another anonymous donor has designated \$125,000 in 1:2 matching funds for new and existing endowments for The Science House. Pledges of \$10,000 or more will be matched at 50 percent. For example, a \$10,000 pledge would be matched by \$5,000, allowing the donor to establish a \$15,000 endowment.

The combined total of a donor's personal gift with their corporate matching funds will also be matched by this program.

Smaller contributions are welcome and can support a general endowment fund for The Science House. For more information, see "How to make a gift" on the inside back cover. □

## Alumnus uses math to master poker

Anyone watching poker on television peers into a world of steely nerves, intense strategy ... and luck.

Michael Binger conquered that world earlier this year, placing third in the World Series of Poker and winning \$4.1 million.

Binger was known to friends and family as a "math whiz" since he was a small child. As a toddler, he counted money from his piggy bank almost every day. Later, he focused on baseball statistics, and was fond of strategy games.

He earned his BS in applied mathematics



Michael Binger

and both a BS and MS in physics from NC State—all in 1999. In 2006, he received his PhD in physics from Stanford University, where he studied theoretical particle physics at the Department of Energy-funded Stanford Linear Accelerator Center.

Binger developed his fascination for the mathematical strategies required to win at gambling while at NC State. On a trip to Las Vegas with a

friend, he became determined to master blackjack. After he figured out the secrets to blackjack, poker became the next challenge.

"I studied poker and read books about it. In early 2002, I tried some high-stakes games and got crushed," he said. "That inspired me to study the game more seriously."

After more study, he was better prepared, and his success eventually propelled him into bigger games.

"Two days after my PhD defense, I was in Las Vegas, preparing for the World Poker Series," he said. Today, he's playing on the professional poker circuit full-time, traveling around the nation and abroad.

Binger said he plans to keep playing poker, which will provide great financial freedom in continuing his research.

"I plan to do some research projects on my own," he said. "I have a lot of ideas." □



# Mathematics, Statistics departments to have new home



*About 150 faculty, alumni and friends gathered at the former site of Riddick Stadium on Oct. 13 to witness a long-awaited ground-breaking ceremony for an important new academic building, and to celebrate the SAS gift that made it possible.*

The \$32 million, 119,000-sq.-ft. building will feature modern teaching technologies, and will be the new home of both the Mathematics and Statistics departments. It will contain state-of-the-art classrooms, computer laboratories, seminar rooms, tutorial centers, offices and gathering spaces for students and faculty.

"There are few areas that have the breadth of impact of the quantitative sciences," said James Oblinger, chancellor of NC State. "Virtually every discipline on this campus will benefit from the kind of work that will

be conducted in this building."

The project is a part of the University of North Carolina Higher Education Bond Referendum, passed by the state's citizens in 2000.

Originally, bond funds were set aside to renovate Harrelson Hall, which has housed the Mathematics Department for 45 years. Although considered an architectural achievement when originally built in 1961, and the first cylindrical classroom structure ever built on a university campus, Harrelson Hall presented challenges to faculty and students from the beginning.

Students on one side of the room couldn't see material that disappeared over the horizon of the curved blackboards. It's loud and has echoes. Also, the building can't keep up with the changing demands of innovations in instruction.

And who doesn't remember walking around ... and around ... and around its circular hallways trying to locate a classroom or office?

Harrelson also presented challenges when it came to renovation. A close examination found that renovation was not cost-effective, and it was impossible to make Harrelson comply with the Americans with Disabilities Act.

It was a smarter use of public funds to build a new building than renovate Harrelson. This presented an opportunity – provide Mathematics with a better facility, and provide Statistics with a permanent, effectively designed home after years of moving from place to place around campus.





PHOTO BY BECKY KIRKLAND

Breaking ground on the new Mathematics and Statistics building are James H. Goodnight, CEO and co-founder of SAS; John P. Sall, executive vice president and co-founder of SAS; Wendell H. Murphy, NC State board of trustees chair; Aloysius G. Helminck, Mathematics Department head; Sastry G. Pantula, Statistics Department head; James L. Oblinger, NC State chancellor and Daniel L. Solomon, College of Physical and Mathematical Sciences dean.

30 years ago. Since then, SAS has maintained a close relationship with NC State, the College and the department. In addition to collaborating with faculty on research, the company

## IT WAS A SMARTER USE OF PUBLIC FUNDS TO BUILD A NEW BUILDING THAN RENOVATE HARRELSON.

has supported scholarships, seminars, internships and fellowships.

“At SAS, we truly understand the importance of the mathematical and statistical sciences, and we believe that it is vital that students in these disciplines are able to learn in an environment that provides state-of-the-art facilities and instructional technologies,” said John Sall, executive vice president and co-

founder of SAS, during the groundbreaking ceremony. It’s also critical that they participate in the kind of collaborative initiatives they’ll experience in the work place, he explained.

“This building is important,” Sall told the crowd. “This building is a ‘must’ for the students and faculty of NC State. That’s why we at SAS decided to make a significant contribution toward ensuring that this building would become a reality.”

Following enthusiastic applause, Wendell Murphy, chairman of the NC State board of trustees, offered the university’s gratitude to Sall and Jim Goodnight, CEO of SAS, who also was present.

“In the language of university development, and that of fundraising campaigns, we call a gift such as yours a ‘leadership’ gift,” Murphy said. “I can think of no one who better represents leadership than you two.”

Sall, Goodnight, Murphy, Oblinger and Solomon then grabbed shovels for the groundbreaking. They were joined by Loek Helminck, head of the Mathematics Department, and Sastry Pantula, head of the Statistics Department.

After a few pictures for posterity, they turned some soil and congratulated each other to another round of loud applause.

It was hard to tell whose smiles were biggest. □

“The smartest strategy was to make the building large enough to house both departments,” said Dan Solomon, dean of the College of Physical and Mathematical Sciences. “Such a facility would offer tremendous benefits in fostering greater collaboration among our faculty and students, and achieving a more cost-effective use of space, technology and other resources.”

There was only one problem — to take advantage of this opportunity, more funding was needed to increase the size of the building to accommodate both departments. This additional funding became a key goal in the College’s portion of the Achieve! Campaign for NC State.

That’s when SAS stepped forward.

SAS, the world’s largest privately-owned software company, was born out of a research initiative that began in the Statistics Department



PHOTO BY BECKY KIRKLAND

Jim Goodnight, James Oblinger and Sastry Pantula discuss how the new building will be sited.





PHOTO BY BECKY KIRKLAND

## Statistics Department marks *65th anniversary*

Joining in the festivities were Ted Horner (PhD '53), Stu Hunter (PhD '54) and Don Gardiner (PhD '56).

Almost 100 alumni, faculty and friends gathered for a brunch on Oct. 14 to celebrate the 65th anniversary of the NC State Department of Statistics. Held at Embassy Suites in Cary, N.C., the brunch was preceded by a poster session highlighting the department's history and current research.

Also on display were a model and floor plans for a new Mathematics and Statistics Building. A groundbreaking ceremony for this new building was held the previous afternoon (see related story page 8).

Daniel L. Solomon, dean of the College of Physical and Mathematical Sciences and former Statistics Department head, greeted participants with a humorous, poetic tribute to the department's history, accomplishments and Medicare eligibility.

Solomon also mentioned the department's recent rise in national rankings. According to the National Science Foundation, NC State ranks fourth in total research and development expenditures, and sixth in federally financed research and development expenditures in the mathematical and statistical sciences.

A more formal look back at the department's history was presented by Larry A.

Nelson, a former faculty member and now assistant dean for international programs in the College of Agriculture and Life Sciences. He recalled stories about the department's founder, Gertrude Cox.

Sastry G. Pantula, department head, then recognized various alumni for their professional achievements and ongoing involvement with the department.

"We are very, very proud of you for all of your successes and for the outstanding recognition you continue to bring to our department," Pantula said. "Our alumni are Fellows of ASA and IMS, members of the National Academy, authors of well-known books, deans, and are successful in the pharmaceutical and computational fields, and in government."

He cited that the department has awarded at least 441 BS, 712 MS and 545 PhD degrees, and counting.

Pantula also recognized several attendees who had received advanced degrees in the department.

Those with the earliest degrees were Jeanne Freeman Williams, who was the second Master's graduate (1946), and Al Finkner, who received his PhD in 1950. He also noted those

who had traveled long distances to join the celebration, such as Susan Fish (BS '94, MS '97) and Tony Barr (BS '62, MS '70 Physics), who had traveled from California and Florida, respectively.

The audience also heard a review of current activities and the future direction for the department. Pantula highlighted the department's success with its receipt of the university's Teaching and Learning Excellence Award, and the NSF-funded VIGRE Grant, which supports programs that broaden student education through vertically integrated teams of undergraduates, graduate students and post-doctoral trainees.

He also noted the department's role in establishing three key research organizations in the Research Triangle area: the National Institute of Statistical Sciences, Research Triangle Institute and the NSF-funded Statistical and Applied Mathematical Sciences Institute.

"We have a great department and it is getting better every day," Pantula said. "And it is always great to hear stories from the past. Like a good wine, they keep getting better."

The brunch was held in conjunction with the PAMS Alumni & Friends Weekend. □



# Student makes rare dinosaur find

Clint Boyd, an NC State graduate student, led an excavation team in the recovery of a nearly complete dinosaur, which will soon be on display at the North Carolina Museum of Natural Sciences (NCMNS).

The team found a remarkably complete skeleton and skin impressions from a 67-million-year-old duckbilled dinosaur, *Edmontosaurus annectens*. The specimen was painstakingly recovered from a Montana hillside last summer, near the town of Ekalaka.

"This species of dinosaur is not rare," said Julia Clarke, assistant professor in the Marine, Earth and Atmospheric Sciences Department. "What makes this one special is the completeness of the specimen."

In fact, this is the most complete dinosaur brought to North Carolina, and its completeness and preservation quality ranks it in the top five percent of all such specimens worldwide.

Since 2004, Boyd has spent summers in Ekalaka, Montana, as a volunteer paleontology camp director for the University of Wisconsin-Madison (UW) geology museum. In 2004, his camp crew found pieces of the dinosaur.

"We found a leg, and we removed everything that was on the surface. We suspected that there was more, so it would be a good site to dig," Boyd said. UW's museum did not pursue it, but Boyd didn't forget about the site.

Back at NC State where he studies vertebrate paleontology, Boyd proposed that NCMNS take over the dig site. Through NC State's paleontology partnership with NCMNS, Boyd helped arrange for UW to transfer ownership of its dig permit to NCMNS.

This August, NCMNS staff members joined Boyd, two UW students and several volunteers in retrieving more of the dinosaur.

The find includes a 400-pound skull and

COURTESY OF CLINT BOYD



Members of Boyd's dig team meticulously remove the dinosaur fossil. Shown are (clockwise from top left) Stephanie West, Drew Eddy, George Rothdrake, Nate West and James Boyd. The vertebral column runs down the middle of the photograph, one of the femurs is in front of Rothdrake, and the shoulder blade is between Rothdrake and West.

about 100 vertebrae. About 80 percent of the skeleton was recovered, with more to be collected. Typically, museum specimens contain only about 50 percent of real fossil, and are often compiled from more than one animal.

"This find is truly unique, and very important to our paleontology program," said Clarke, who is also research curator of paleontology at NCMNS.

Ekalaka is located in the Hell Creek Formation, an intensely studied formation of Upper Cretaceous sedimentary rock. This formation has produced impressive varieties of invertebrates, plants, mammals and fish, as well as large dinosaurs like the *Edmontosaurus*, as well as *Triceratops* and *Tyrannosaurus rex*.

The partnership with the museum provides outstanding opportunities for joint research. Students and faculty are able to collaborate with museum staff, and the public will have opportunities to see specimens on display.

"NC State has gained access to some remarkable sites in Montana," said NCMNS Director Betsy Bennett. "We are thrilled to be working with them in recovering dinosaurs that will ultimately enhance our collections, our exhibits, and our understanding of dinosaur preservation."

Mary Schweitzer, NC State assistant professor and curator of vertebrate paleontology, will attempt to recover soft tissue from the fossil, using a process she developed that has gained worldwide attention.

The *Edmontosaurus* skull should be ready for museum display in about a year. A 2007 expedition is planned to retrieve the remaining vertebrae in Ekalaka. □

PHOTO BY SALLY RANEY



Clint Boyd cleans the *Edmontosaurus* skull.



# PAMS presents second Alumni & Friends Weekend

PHOTOS BY SALLY RAMEY



More than 240 people registered for the second PAMS Alumni & Friends Weekend, held Oct. 13-14 on campus and at Embassy Suites in Cary.

The weekend included an afternoon “mini college” featuring a series of short classes on a variety of science topics, the groundbreaking for the new Mathematics and Statistics Building, a dinner with guest speaker, the 65th anniversary of the Statistics Department, and a casual gathering of football fans to watch the NC State-Wake Forest game.

The event kicked off with a welcome reception in the lobby of the Marye Anne Fox Undergraduate Science Teaching Laboratory, followed by three sessions of classes taught by PAMS faculty. Topics ranged from engineering new liquids to understanding the research into global warming to using mathematics for development of new materials.

PAMS alumnus Ed Link, who chaired the Army Corps of Engineers’ research team that conducted a forensic study of the New Orleans levee failure, presented a class on that topic.

Following the mini college, participants took a quick bus ride to the former site of Riddick Stadium to witness the groundbreaking for the Mathematics and Statistics Building (see related story, page 8).

The evening’s festivities began with a social and silent auction at Embassy Suites. Members of the PAMS Alumni & Friends Advisory Board gathered together an impressive selection of gift items and packages available for bid.

Leigh Wilkinson, president of the Advisory Board and who presided over the dinner program, received a loud round of applause when she announced that the silent auction raised more than \$5,000 to support scholarships for the College.

Peter J. Webster, whose controversial research indicates that global warming is increasing the number of severe hurricanes, was the dinner’s keynote speaker. Instead of



**(top)** Keynote speaker Peter Webster focused his dinner presentation on the regional and societal impacts of global warming.

**(middle)** Lawrence Ives, Len Pietrafesa and Herb Strickler share a laugh.

**(bottom)** Ed Link (right) had a chance to catch up with Eleanor and Charles Welby.



# ds Weekend

**(top left)** At the PAMS Alumni & Friends Weekend, Cynthia Cudaback explains the complex gadgetry needed to study the movement of baby oysters, including small floating devices that can phone home via satellite.

**(top right)** Victoria Gerig listens intently to one of the mini college presentations.

**(middle)** Tony Barr chats with Provost Larry Nielsen and his wife, Sharon.

**(bottom)** Steady...steady. Jack Penny's team members watch him attempt to balance interlocking nails in the *Physics from the Junk Drawer* class.



the typical discussion about whether or not global warming is a reality, he raised thought-provoking questions about regional and societal impacts of global warming.

The most disturbing example he cited was the fact that a small rise in sea level would flood practically the entire nation of Bangladesh, forcing millions of refugees to go ... where?

Looking at options in the Southeast Asian region, and taking into account the religious differences of the region, there are few places where this population would be accommodated, much less welcome. The likely destination seems to be Australia.

Webster has joint appointments in both the School of Earth and Atmospheric Sciences and the School of Civil and Environmental Engineering at the Georgia Institute of Technology in Atlanta.

"It was a great weekend," said Wilkinson. "We had something for everyone, and we had guests of all ages return to campus for the event. I think it really helps everyone feel that they are still part of the College."

To see a photo gallery of weekend activities, visit [www.pams.ncsu.edu/weekend06](http://www.pams.ncsu.edu/weekend06). □



## PAMS Alumni & Friends Weekend Committee

Cindy Clark and Joe Hackley (Co-Chairs)  
Scott and Kathryn Guthrie  
Glenn and Lynn Osmond  
Benton and Beth Satterfield  
Liisa Trent  
Bill White  
Leigh Wilkinson



COURTESY OF CARL MEYER

## Meyer, Langville uncover the magic behind Google

*When you consider how many millions of Web sites there are, it seems magical that Google can find what you need with only a key word or two.*

Actually, it's not magic—it's mathematics, or more specifically, linear algebra.

Carl Meyer and Amy Langville explain the mathematics behind the world's most popular search engine in a new book, *Google's PageRank and Beyond: The Science of Search Engine Rankings*. It is the first book ever written on this topic, and has received rave reviews.

Meyer is a professor of mathematics at NC State, and Langville is an assistant professor of mathematics at the College of Charleston in Charleston, S.C. Meyer supervised Langville during her postdoctoral studies in mathematics after she completed her PhD in operations research in 2002.

"We wrote the book to appeal to both the curious science reader and the more technical reader," said Meyer. "In fact, the first several chapters are accessible to the general reader, so anyone can learn some amazing things about Web search engines through this book."

How Google works is a popular topic among professionals and hobbyists alike. Meyer taught a class on this subject at the 2005 PAMS Alumni & Friends College, and so many

people registered for it that he taught three sections.

Google and other search engines use a ranking system, and organizations interested in improving their rankings in the major search engines can benefit from the information provided in the book.

One might think that Google wouldn't want everyone to know how its search engine works, but the company didn't object to the book being published. It was much more difficult to get permission to use the company's trademarked wordmark for the cover, said Meyer.

The insightful and often entertaining book has been lauded by reviewers representing academia, technology, the media and general public on both the Amazon and Powell's Bookstore Web sites.

For Langville, the book represented an opportunity to work with her mentor.

"You hear that it's important to find a good fit between the advisor and the student. Well, Dr. Meyer and I couldn't have fit together any better," said Langville. "I learned so much from him, and when I look back now, I realize that

we really accomplished a lot together."

Now separated by a four-hour drive, the two mathematicians have had to learn a different way to collaborate.

"We've had to get better about discussing mathematical ideas over the phone, without the help of a whiteboard or pencil and paper," Langville said. "We've both adjusted well to this. It helps that we are so familiar with each other's work and style, and greatly enjoy working together."

Langville's research focuses on algorithms for information retrieval and text and data mining applications. Meyer's research areas include numerical analysis, linear algebra and Markov chains.

So with such a broad list of interests, what's next for this research team?

"We're trying to use mathematical models to rank sports teams and predict outcomes of games," Meyer said. "Sometimes you can teach so much by showing how mathematics applies to everyday things to which people can relate ... like Google or any upcoming NC State-Carolina game." □



## PAMS faculty bring NC State to national and international stages

Stephen Reynolds of the Physics Department was not the only NC State faculty member to appear on the national or international stage recently (see related story on page 4).

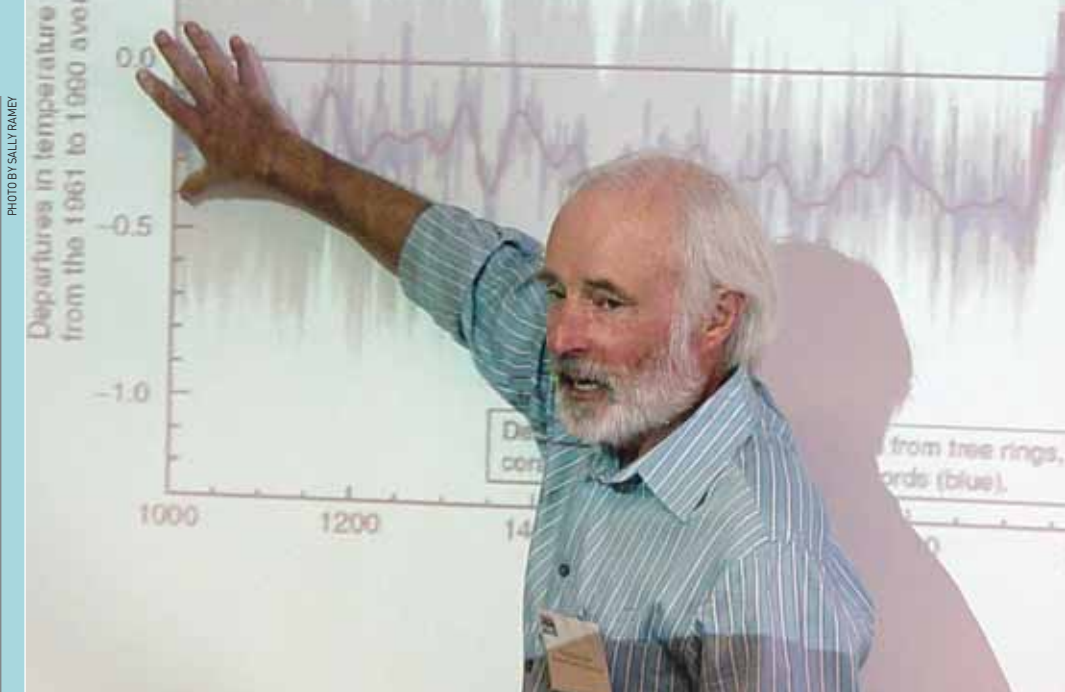
Viney Aneja of the Department of Marine, Earth and Atmospheric Sciences led the world's first conference on agricultural air quality, an issue with complexities in both science and public policy (see related story page 24).

Mike Whangbo of the Chemistry Department received an honorary doctorate from France's Universite de Nantes.

Peter Bloomfield of the Statistics Department was called to serve on a blue-ribbon National Academy of Sciences panel charged by Congress to review the scientific accuracy of controversial global warming research.

These are just a few examples of how PAMS faculty are making the nation and world more aware of NC State, and the work done by its faculty and students.

The Biomathematics Graduate Program of the Mathematics and Statistics departments brought the world to campus this past summer for what is believed to be the largest biomathematics conference ever held in the U.S., with more than 500 participants. It was jointly sponsored by the Society for Mathematical Biology



Peter Bloomfield of the Statistics Department was selected to serve on a special panel organized by the National Academy of Sciences to review some controversial research findings regarding global warming in the northern hemisphere. The review was requested by Congress. Here, he explains the findings of the panel.

and the Society for Industrial and Applied Mathematics' Life Sciences activity group.

"We had over 500 papers submitted for the conference," said conference organizer Charlie Smith, associate professor in the Statistics Department. "The work represented virtually every application of biomathematics and systems biology."

The Physics Department also hosted a significant nanotechnology conference, organized by Professor Robert Nemanich.

The joint International Conference on New Diamond Science and Technology and The Applied Diamond Conference were held in

Research Triangle Park in May. The conference brought together more than 230 researchers from 18 countries to explore the latest discoveries, advances, applications and technology developments involving diamond and related materials.

"Activities like these showcase our departments, faculty and students, bringing distinction to the College and NC State," said Ray Fornes, associate dean for research in the College of Physical and Mathematical Sciences. "We are a great university and our programs are among the best. Exposure like this raises awareness of the quality of our work." □

## PAMS faculty honored for teaching excellence

Roger Woodard, assistant professor of statistics, received the 2005 Waller Award for Innovative Statistics Education from the American Statistical Association. He was cited for presenting "beautifully crafted" classes, effectively mixing lecture with do-it-yourself activities, outstanding student relations and making "a large room seem small."

Woodard is just one of many PAMS faculty members who receive department, university, state and national recognition for outstanding teaching. In some cases, entire departments have been recognized for overall teaching excellence.

Each year, the NC State Alumni Association

honors faculty for outstanding teaching, research, extension and outreach. A dozen current PAMS faculty members have received the Distinguished Undergraduate Professor award, and five current faculty members have received the Distinguished Graduate Professor award.

The NC State Academy of Outstanding Teachers includes three dozen members who are current or recently retired members of the PAMS faculty.

The Physics, Statistics and Mathematics departments received the NC State Departmental Teaching and Learning Excellence award in 2003, 2005 and 2006, respectively.

This doesn't count the many awards

bestowed on faculty by outside organizations, which is difficult to track. For example, Robert Beichner of the Physics Department recently won the George B. Pegram Award for Excellence in the Teaching of Physics by the Southeast Section of the American Physical Society.

"Awards do have meaning in that they represent recognition by your peers that you're doing a great job," said Jo-Ann Cohen, associate dean for academic affairs. "But I believe that all faculty would agree with me that no award means as much as when a student, or former student, tells you that you've made a difference." □



# PAMS faculty selected to direct university initiatives



PHOTO BY ROGER WINSTEAD

Robert Beichner



PHOTO BY SALLY RAMEY

Chris Gould



COURTESY OF MARCIA GUMPERTZ

Marcia Gumpertz

*The university has capitalized on the talent within the College, tapping three faculty members for leadership positions in programs that will have significant impact on NC State and beyond.*

## Beichner to direct new education research center

Robert Beichner, professor of physics, has been named director of the Center for Discipline-Based Education Research and Application.

Administered through Provost Larry Nielsen's office, the new center's mission is to enhance the nation's science, technology, engineering and mathematics (STEM) capabilities by developing, assessing and sharing innovative teaching methodologies applicable at all levels of STEM education.

It will accomplish this mission by providing support to STEM faculty and graduate students who carry out education research.

The center also will offer workshops and hold national conferences to further the application of research findings in classrooms.

Beichner will continue his departmental teaching duties and will maintain his active research program in physics education.

## Gould to head university-wide energy initiative

Chris Gould has been selected to lead the NC State University Energy Initiative.

Energy issues will have a profound effect on our society for the foreseeable future, and NC State has the most comprehensive set of energy experts in the state. The Energy Initiative will seek to facilitate and serve as a point-of-contact for energy-related programs ranging from renewable, fossil and nuclear sources, to energy use, energy transmission, energy and the environment, and energy public policy issues.

Gould's responsibilities include conducting an inventory of energy programs on campus, and exploring ways to partner with industry, foundations, and federal agencies for leveraged research and program support. A seminar is planned for March 13, followed by a workshop series.

Gould is a professor of physics and currently serves the College as associate dean for administration. Previously, he served as head of the Physics Department for 10 years.

## Gumpertz named as assistant vice provost for faculty and staff diversity

Marcia Gumpertz, professor of statistics, has been named assistant vice provost for faculty and staff diversity, in the Office of Diversity and African American Affairs.

A long-time participant in the Association of Women Faculty, Gumpertz will serve as the office expert on women and gender affairs. She will focus on recruitment, retention, and improving the climate for women and under-represented faculty and staff groups.

Gumpertz will serve as liaison to women and minority faculty and staff organizations on campus and the college diversity coordinators; develop and implement recruitment and retention programs for faculty and staff; facilitate, promote and assess the effectiveness of NC State's diversity education program; and develop and implement a diversity assessment plan for the campus.

Gumpertz will maintain her academic appointment in the Department of Statistics.

□

# Boyles named director of State Climate Office

Ryan Boyles has been named director of the State Climate Office (SCO), located on Centennial Campus.

The SCO is a public service center in the College of Physical and Mathematical Sciences. Its focus is the extension of weather and climate information and science to support education, government and businesses in North Carolina.

Boyles received a BS in meteorology from NC State in 1997. While working at the SCO, he earned his MS in 2000 and his PhD in 2006.

Boyles is the chief scientist responsible for promoting the SCO's climate services for extension, research, and education of applied meteorology and climatology. He supervises staff and students, assists state and county agencies, and interacts with a variety of public and private sector clients to ensure development and delivery of advanced climate science and services.



Ryan Boyles

The SCO is involved in a wide variety of climatological research, including NC climate change and variability, El Niño/La Niña effects on NC weather and climate, agricultural and water resource management, air quality and environmental management, disaster mitigation, and land-falling hurricanes in North Carolina. The SCO partners with state and federal agencies, and its work is of vital importance to agriculture, industry, emergency management and others.

Boyles works to increase the exposure of the SCO and NC State as a resource for weather and climate expertise and information, including expansion of the NC Environment and Climate Observing Network (NC ECONet) and development of weather- and climate-based decision support tools.

Professor Sethu Raman entered phased retirement after 10 years as SCO director. □

# Eggleston to direct CMAST

David Eggleston, a professor in the Marine, Earth and Atmospheric Sciences Department, has been named director of the Center for Marine Sciences and Technology (CMAST), located on the Carteret Community College campus at Morehead City, N.C.

CMAST confronts the urgent questions involving coastal ecologies, environments, economies and management policies by fostering multidisciplinary studies among research scientists, educators and extension specialists. CMAST works with other educational institutions and agencies concerned with similar issues, provides local citizens a point of contact with NC State's marine sciences faculty, and makes educational opportunities available to the community as well as to students.

Resident and rotating faculty at the 51,000-



David Eggleston

sq.-ft. marine laboratory come from several departments in the colleges of Agriculture and Life Sciences, Physical and Mathematical Sciences and Veterinary Medicine. These faculty use CMAST for research, field studies and projects. NC State professional and post-doctoral staff, extension specialists, research technicians, graduate assistants and administrative staff are stationed at CMAST.

Eggleston earned his BS in biology from Old Dominion University in Richmond, Va., in 1980. He later earned his MS in marine ecology in 1988 and his PhD in marine ecology in 1991, both at the College of William & Mary in Williamsburg, Va.

Eggleston replaces CMAST's first director, David Green, who continues as director of the NC State Seafood Laboratory. □



Mary Higby Schweitzer

# Schweitzer receives Packard Foundation Fellowship

Mary Higby Schweitzer, assistant professor in the Department of Marine, Earth and Atmospheric Sciences, has been awarded a five-year, \$625,000 fellowship from the David and Lucile Packard Foundation.

Schweitzer was one of 20 researchers nationwide to receive Packard Foundation fellowships this year. The Packard Foundation administers one of the nation's largest nongovernmental programs of unrestricted grants to faculty members in science and engineering. Each year, the Foundation invites only 50 universities to submit two nominations for consideration.

Schweitzer, whose discovery of soft tissue in fossilized dinosaur bone was cited by *Discover* magazine as the #6 science story of 2005, will use the grant to further her research into the biogeochemical interactions that lead to fossil preservation.

Schweitzer holds a joint appointment at the N.C. Museum of Natural Sciences as curator of vertebrate paleontology. She recently taped an episode of the Public Broadcasting System's prestigious science program, *Nova*. No air date was available at press time. □



# Model reveals better HIV treatment strategies

Researchers at NC State have received a five-year, \$3.5 million grant from the National Institute of Allergy and Infectious Disease (NIAID) to develop mathematical and statistical models that will aid in designing new treatment strategies for HIV patients.

This grant will help the team devise a mathematical model that can predict the best course of treatment for acutely infected HIV patients, as well as patients who have recently been infected with the virus.

The team includes H. T. “Tom” Banks, mathematics professor and director of NC State’s Center for Research in Scientific Computation (CRSC); Marie Davidian, professor of statistics and member of CRSC; Eric Rosenberg, clinician at Massachusetts General Hospital, professor at Harvard Medical School, and CRSC member; and Hien Tran, professor of mathematics, associate head of the Department of Mathematics, and CRSC member.

Banks also is Drexel Professor of Mathematics, and Davidian has a joint appointment as William Neal Reynolds Professor in the College of Agriculture and Life Sciences.

“Based on what we know about HIV, there is really no consensus on the best treatment for acutely infected individuals,” Davidian said. “The medical community needs to know how immediate drug therapy may affect the patient’s own ability to cope with the disease, and with the treatment itself down the line.”

When a patient is first infected with HIV, the amount of virus present in the bloodstream, or viral load, skyrockets. Current drug therapies can quickly bring the viral load down to a “set point,” or stable level. However, even without drug therapy, the patient’s viral load decreases to a set point over time, leading some researchers to wonder whether it’s best to allow a patient’s body to adapt to the virus naturally, or whether allowing the body to cope with acute infection, and thus “learn” the virus, actually damages the immune system beyond repair.

In addition, HIV patients tend to develop drug resistance or reactions to the medications the longer they are treated, necessitating frequent “drug holidays.” So the question becomes not only whether to treat these patients immediately, but also, how long each treatment interval should last.

Fortunately, the team exploring these questions has data on its side—more than five years of patient treatment data from Rosenberg.

“The first step is to use existing data to



PHOTO BY SALLY RAMEY

Marie Davidian and Tom Banks

develop a mathematical model that can show us what happens to acutely infected patients when they are treated or not treated,” Banks said. “Then we extrapolate from the existing data using statistical methods, to see what the model predicts will happen under no treatment or under a given treatment interval. Based on the results, we can design a clinical trial to see if the data from actual patients match the predictions.”

The model takes into account a number of patient variables, such as viral load and how long they’ve been infected, which vary within the patient population.

“Once we’re convinced that this mathematical model is appropriate, we can then simulate virtual patients by combining it with a statistical model for the variation in the patient population in order to test treatment theories,

to determine the most promising treatment times and durations for optimum results,” Davidian said.

Eventually, Rosenberg will run clinical trials with actual patients to test the team’s results. If all goes well, the research could lead to a new approach for treating acutely infected HIV patients—one that takes personal variables into account for each patient and tailors treatment accordingly.

“It’s not a cure, but maybe it can improve the quality of treatment these patients receive,” Davidian said. “And this work has implications for a number of other diseases that involve compromised immune systems. We hope that this mathematical-statistical modeling approach will be a step toward the current goal of modern medicine—personalized treatment of diseases.”

□

# Chemists light the way for studying proteins

A group of scientists, including a chemist at NC State, has discovered a more efficient way to create fluorescently labeled proteins that will aid in biomedical research.

Alex Deiters, assistant professor of chemistry, assisted colleagues from the Scripps Research Institute in his postdoctoral work. The group's findings appeared online in *Proceedings of the National Academy of Sciences*.

**"This important technique is used in virtually every kind of biomedical research."**

*Alex Deiters*

Fluorescent labels have long been used by biomedical researchers in studying the structure and function of proteins and how they interact with their environment.

"This important technique is used in virtually every kind of biomedical research," said Dieters. "This technique is used for studying diseases, genetics, medicines and more."

Researchers "label" proteins by attaching a fluorophore, or fluorescent molecule, to the protein they are studying. In the past, the most commonly used fluorescent label was Green Fluorescent Protein (GFP), which comes from jellyfish.

However, since GFP is itself a protein, there are certain limitations to its use. For example, it can only be attached to the beginning or the end of the protein molecule under investigation. Additionally, the size of this fluorescent label might alter the structure or function of the protein being studied, which has implications for the accuracy of the research.

To address this problem, the research team altered the genetic code of yeast, an easily manipulated organism, to incorporate a synthetic, fluorescent amino acid. It is about 200 times smaller than GFP and can be placed at specific sites within the protein molecule being studied. This enables the fluorescently labeled protein to be used in both *in vivo* and *in vitro*—or both inside and outside of a living organism.

"The technique we devised for incorporat-



Alex Deiters

ing this fluorophore will allow researchers a much more efficient way to study the functions of proteins within living cells," Deiters said. "Scientists will have much more control over the location of the fluorescent label within the protein, lending a higher degree of precision to their research." □

## Mark your calendar

**March 13, 2007**—The NC State Millennium Seminar series will kick off the university's Energy Initiative (see related story 16) with a special program on an energy-related topic. This lecture series is coordinated by North Carolina's first lady Mary Pipines Easley. For more information as plans are confirmed, visit [www.ncsu.edu/millenniumseminars/](http://www.ncsu.edu/millenniumseminars/).

**April 20, 2007**—Robert H. Grubbs, recipient of the 2005 Nobel Prize in chemistry, will present the annual Phi Lambda Upsilon (PLU) Lecture on April 20, 2007. Grubbs is the Victor and Elizabeth Atkins Professor of Chemistry at California Institute of Technology in Pasadena. GlaxoSmithKline is sponsoring the lecture. Registration is not required to attend the lecture. Please visit the Chemistry Department Web site at [www.ncsu.edu/chemistry](http://www.ncsu.edu/chemistry) for the lecture location and time. □

## Be the first to know

The College of Physical and Mathematical Sciences has an e-bulletin that is sent to a distribution list of interested alumni and friends. *PAMS Focus* is produced as significant news becomes available, and keeps recipients up-to-date on the latest developments within the College and its departments.

To join the distribution list, simply contact the Office of Development and College Relations by sending an e-mail message to [pam-salumni@lists.ncsu.edu](mailto:pam-salumni@lists.ncsu.edu). We'll need your name, class year, degree, address, phone and e-mail address to add you to the distribution database. If you did not graduate from NC State, you may still receive *PAMS Focus*—please tell us you are not an alumnus in your message. □





# NC State physicists unlock mysteries of the DVD-RAM

DVD technology is by no means new, but that doesn't mean that we know everything about the way these devices store movies and data. In fact, we haven't known exactly how they work.

However, research conducted by scientists in the Physics Department has provided new

insight into how this mature technology works. Their findings may lead to advances in data storage as well as within the computer industry as a whole.

Dave Baker, a physics doctoral candidate, and colleagues from the Colorado School of Mines and the Indian Institute of Technology, discovered how DVD-RAMs work on the microscopic level. Baker also worked with Michael Paesler and Gerald Lucovsky, both professors in the Physics Department. Their findings appeared in the July 7 edition of *Physical Review Letters*.

DVD-RAMs, or read/writable DVDs, are composed of an alloy that contains three elements: germanium (Ge), antimony (Sb) and tellurium (Te). This alloy is commonly used in data storage technologies due to its ability to change phases from a crystalline to a non-crystalline state. The phase changes are what allow the DVD-RAM to take and hold data. While scientists were familiar with the basic properties of the alloy, they didn't know how it worked on a microscopic level—why one particular ratio of elements worked better than others.

Baker and his team used a tool called EXAFS to examine the alloy on the microscopic level. EXAFS, or extended x-ray absorption fine struc-

ture, is a type of x-ray spectroscopy that allows scientists to determine specifically which atoms are present in a particular material, and where they are located in relation to each other. By then applying bond constraint theory to the data, the researchers were able to calculate the optimum ratio of elements within the material.

"With EXAFS, you have the ability to look at the position of atoms within the material both before and after a switch from the crystalline to the non-crystalline state," Baker said. "It shows you exactly how the mechanism works to get the material from one state to the other."

The practical result of the information is that scientists will be able to "fine tune" the alloy, which could lead to the development of not only more efficient data storage devices but also remotely reconfigurable electronics—for example, computers that could be sent into orbit and then reprogrammed as needed without the cost of sending up another spacecraft or satellite.

"Our work deepens the understanding of these materials," Baker said, "and that will in turn allow us to create more efficient materials that will be useful in a number of applications." □

PHOTO BY SALLY RAMEY



Dave Baker



# International XAFS Society remembers Sayers

Dale Sayers was fondly remembered at the 13th conference of the International XAFS Society, held at Stanford University in Stanford, Cal., in July 2006, through an award and symposium in his name.

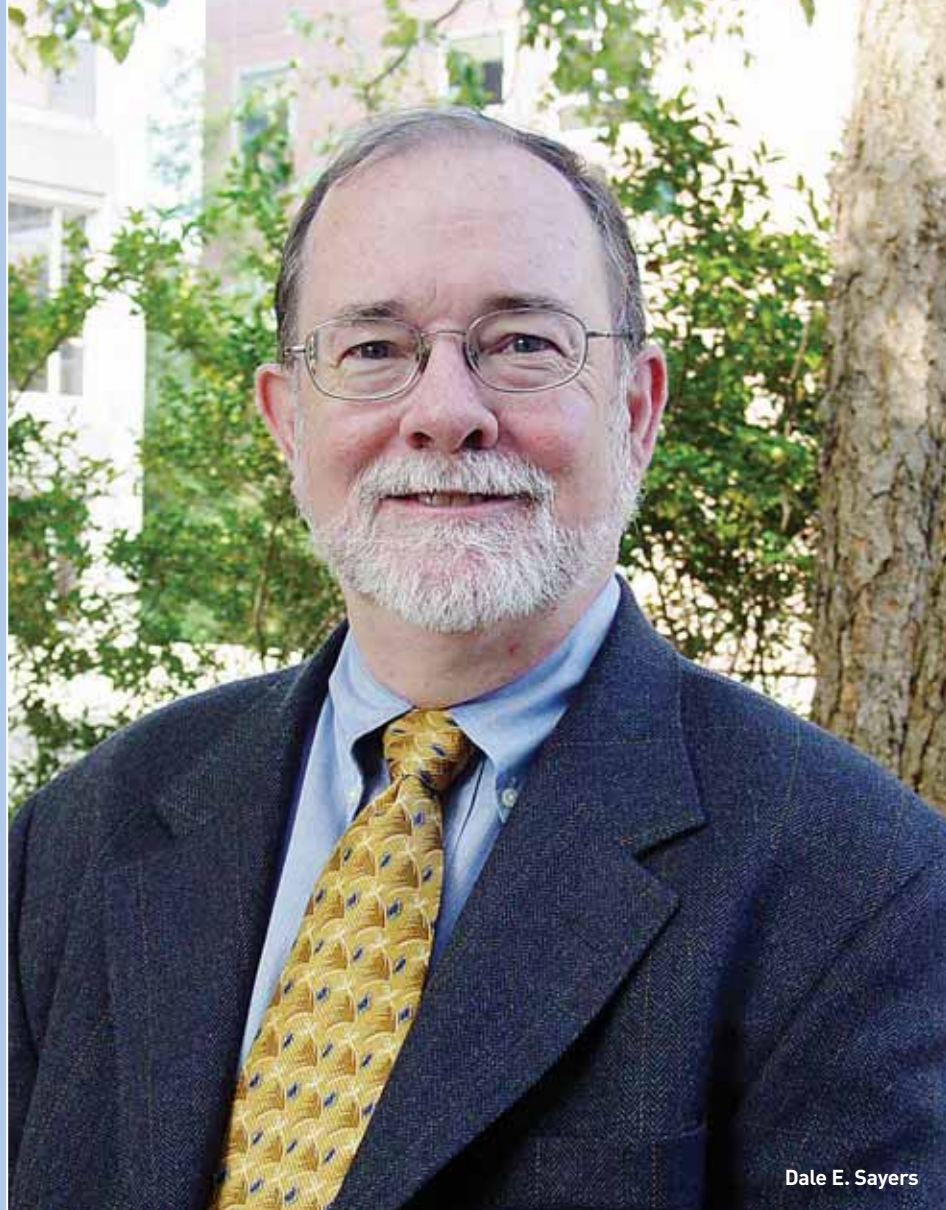
Sayers, who died unexpectedly in 2004, was a pioneer in EXAFS – extended x-ray absorption fine structure – a key analytical tool now used by scientists around the world. His work opened a new field of research using this technology. He also was affiliated with a team that discovered a new x-ray technique, called diffraction-enhanced imaging, that may become a new tool for mammography, osteoarthritis investigations and bone density studies.

He was a member of the NC State Physics Department faculty.

The half-day Dale Sayers Symposium included 10 presentations by scientists from around the globe, who described Sayers' role in EXAFS and related research, and his professional and personal impacts on the field and the people with whom he worked.

The symposium proceedings will be gathered into a *festschrift*. A *festschrift* is a German term for a memorial document in which colleagues pay tribute to a scholar's works and impact.

"Dale was an exceptional scientist and person," said Michael Paesler, head of the Physics



Dale E. Sayers

Department. "He not only had a great influence on science, he had a great influence on those who were fortunate enough to work with him. The conference presented an

outstanding tribute to his memory."

During the symposium, many participants offered anecdotes on their experiences working with Sayers. One seminar participant even dressed in Sayers' distinctive casual conference attire—a plaid shirt.

As part of the symposium, Sayer's wife, Anne, presented the first Dale Sayers Young Scientist Award to Jan-Dierk Grunwaldt of ETH Zurich, Switzerland. This award will be given every three years in recognition of Sayers' significant contributions.

Anne Sayers had an opportunity to address the audience, to whom she provided information about the fund supporting the Young Scientist Award and an NC State graduate student fellowship. She was accompanied to the conference by Sayers' daughter, Mary McLaurin.

For information about supporting the Dale E. Sayers Memorial Fund, see "How to make a gift" on the inside back cover. □

## Physics Department introduces Sayers Lecture

The Physics Department has initiated a new annual lecture series to honor Dale Sayers' memory and his many contributions to NC State and the scientific community.

The first lecture was presented by Michael Paesler, department head. The topic, "The Glass Computer," dealt with new understandings about the electronic switching behavior of a particular kind of glass used in DVDs. This glass has received considerable attention as a possible candidate to provide the basis of a glass-based computer memory.

The material is derived from the dissertation work of Dave Baker, as described in the story at left. □



# Teaching and mentoring our students

## *Professorships attract, retain top faculty*

“Professors at State had such a tremendous impact on me as an undergraduate student—certainly in teaching and in opening the world of mathematics to me. Most importantly, however, was their influence as mentors, convincing me that I could have a professional career in mathematics.”

This is the reason why Emily Mann Peck (BS '67 Applied Mathematics), retired associate dean at the University of Illinois at Urbana-Champaign, includes funding for the N. Tenney Peck and Emily Mann Peck Endowed Professorship as part of her estate plans.

With its programs now competing with the best in the nation, PAMS is finding it more challenging than ever to recruit and retain qualified faculty. A named professorship, which provides supplemental support for a faculty position, is one tactic in attracting outstanding faculty members who will be the inspiration for our students.

However, PAMS has few professorships to offer, and compared to its peers, is at a disadvantage when recruiting or retaining highly competitive faculty.

“Named professorships are an increasingly important tool in retaining our top faculty, not only for the financial support they may contribute to salary or programmatic purposes, but also for the prestige they bring to one’s career,” said Dean Dan Solomon at a recent meeting of PAMS alumni and friends.

Solomon also noted that professorships are important in attracting senior scientists from other institutions. He related the challenges of a recent negotiation with a senior candidate to lead a key graduate and research program in the College. Because this candidate

PHOTO BY ROGER WINSTEAD



**“WHETHER WE  
ARE IN THE  
CLASSROOM OR  
IN THE LAB,  
WE ARE TEACHING  
ALL THE TIME.”**

*Jon Lindsey*

currently holds a professorship, it was difficult to offer a competitive package without including a named professorship. PAMS was not successful in attracting this potential faculty member.

Endowed professorships provide flexible funding for expenses such as summer salaries, travel, support for students, postdoctoral associates and other staff, laboratory equipment and supplies, and needs not funded by state or federal sources.

One PAMS faculty member who was recruited with a named professorship is Jonathan Lindsey, GlaxoSmithKline Distinguished University Professor of Chemistry.

Lindsey conducts research in the innovative areas of molecular data storage and alternative energy. He plans to use individual molecules as storage devices, which would revolutionize the world of computing.

Also intriguing is his strategy to mimic chlorophyll's ability to transform sunlight into energy. If successful, his work will lead to photovoltaic solar cells based on organic molecules, instead of the inorganic materials used in conventional solar cells.

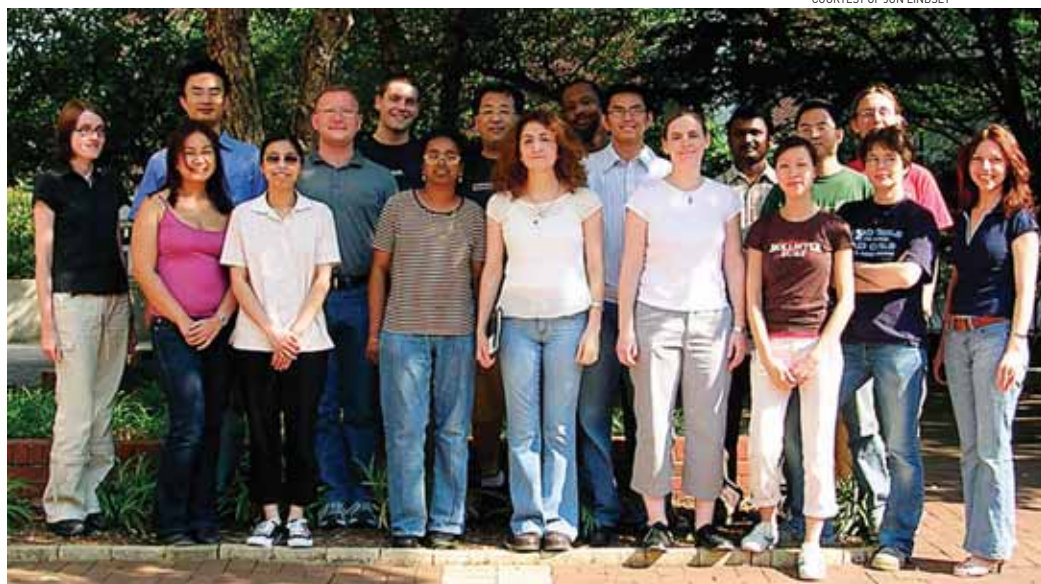
Lindsey supervises up to 15 graduate students and postdoctoral associates. In addition, he typically has two to four undergraduate students working with his research group—students whose participation is funded by Lindsey's professorship.

"At a research university, faculty have multiple responsibilities," Lindsey said. "We educate undergraduates and we train the next generation of scientists. So whether we are in the classroom or in the lab, we are teaching all the time."

Lindsey also teaches organic chemistry for both undergraduate majors and graduate students.

"You could consider Jon an academic 'triple threat.' He's a respected teacher and mentor, both in the traditional classroom and in the laboratory; he is a leader in his field of research; and he's an entrepreneur whose discoveries contribute to economic development," said Jo-Ann Cohen, associate dean for academic affairs. "This is the kind of faculty member we want inspiring our students to further their careers in science."

Endowed professorships are a key component of the PAMS portion of the Achieve! Campaign for NC State. For more information, contact Anita Stallings, executive director of development and college relations, at 919-515-3462 or [astallin@ncsu.edu](mailto:astallin@ncsu.edu). □



**Lindsey gathered his research team together this summer for this group portrait. Representing China, France, Hungary, India, Japan, Malaysia, Poland, Romania, Turkey, Vietnam, and the United States, the group includes four undergraduates, six graduate students and eight postdoctoral associates.**

## Professorships "on sale" for 67% off!

The minimum endowment level to establish a professorship is \$1 million—an objective which has just become easier to reach, thanks to a new matching program.

The N.C. State Legislature provides funds to the Distinguished Professors Endowment Trust Fund to match endowed professorship gifts on a 1:2 basis. This legislative match, managed by the UNC Board of Governors, reduces the donor contribution for a \$1 million professorship to \$666,000.

However, even with this program, the number of potential donors at this level is limited.

The PAMS Campaign Committee recently discussed strategies for meeting the College's campaign objective to secure \$5 million to establish endowed professorships. The group recalled the recent successful experience with The Science House challenge, which provided a match to donors' contributions that resulted in the establishment of more than 15 new endowments to benefit the K-12 outreach program.

With this in mind, the Committee allocated \$2 million originally designated for endowment in any unmet campaign category as an additional match to the legislative

grant for professorships in PAMS.

This means that a donor's gift of \$333,000 leverages a campaign match of \$333,000, which leverages the legislative match of \$334,000. So, for \$333,000, a private donor, whether corporate or individual, will create a \$1 million professorship. The donor would receive naming rights to the endowment.

With this scenario, PAMS could leverage as many as six \$1 million professorships.

"The opportunity to establish a \$1 million named professorship at this discounted level is a bargain for our donors and a bonus for the College," said Anita Stallings, executive director of development and college relations. "Professorships are crucial to attracting and retaining outstanding faculty who in turn attract top students and motivate the next generation of scientists, scholars and policy makers."

While professorships require a minimum endowment of \$1 million, they are not limited to that amount. Larger endowments provide more discretionary income for the faculty member.

State matching funds now provide as much as \$667,000 to encourage larger gifts for professorships. □



# NC State leads international discussion on agricultural air quality



PHOTO BY SALLY RANEY

It isn't often that environmentalists, policy-makers, scientists, regulators and economists all see eye-to-eye on pollution, but an NC State scientist changed all that by spearheading the first national workshop on agricultural air quality. The four-day workshop grew to global proportions as many participants from other nations registered.

More than 350 people attended "The Workshop on Agricultural Air Quality: State of the Science," at the Bolger Conference Center in Potomac, Md., in June.

Professor Viney Aneja of the Marine, Earth and Atmospheric Sciences Department co-chaired the workshop with Dean William Schlesinger of Duke University's Nicholas School of the Environment and Earth Sciences. They created the workshop in response to agriculture's increasing impact on the environment, and specifically, on air quality.

"Industrial agriculture is a very effective and efficient way to feed large populations, but no one has ever really studied the impact of agriculture on air quality," Aneja said. "With our many products and the fact that we have agriculture throughout our state instead of just in one area, North Carolina is really an excellent case study in terms of agricultural air pollution."

The event addressed two key issues: identifying airborne pollutants produced by agriculture, and suggesting best practices for mitigating these emissions to preserve the environment.

"As a land-grant institution already engaged in agricultural issues, we hoped to capture the imagination of the scientific community and

bring this issue to national and global prominence," Aneja said. "As other nations, and other parts of our own country, face the same issues we face in North Carolina, we are in a position of leading this new field of research."

Topics addressed ranged from air quality standards to ecosystems and economics. Poster and plenary sessions offered attendees from various disciplines and backgrounds a chance to find common ground.

Ralph J. Cicerone, president of the National Academy of Sciences, gave the keynote address.

NC State's workshop contingent included more than 30 students, faculty, administrators and Chancellor James L. Oblinger, who provided welcome remarks.

The workshop is funded by a three-year, \$400,000 grant from the Cooperative State Research, Education and Extension Service, a division of the U.S. Dept. of Agriculture, with additional funding from the National Science Foundation and other organizations. Workshop reports may be found at [www.esa.org/air-workshop](http://www.esa.org/air-workshop). □

## Aneja named to governor's task force

A spectacular Oct. 5 fire at a hazardous materials warehouse in Apex, N.C., rattled nerves and raised a lot of questions about the handling of hazardous materials and waste.

About 15,000 residents were evacuated as officials sought to understand what was burning and what, if any, effects the smoke may have on residents or the environment.

A variety of chemicals were thought to have been involved in the fire, but no inventory was available to authorities at the time of the blaze.

After making national news, the fire was followed by a second scare several days later when a damaged metal drum burst into flames and smoked for more than an hour. It contained solid sodium, which ignited after exposure to rain.

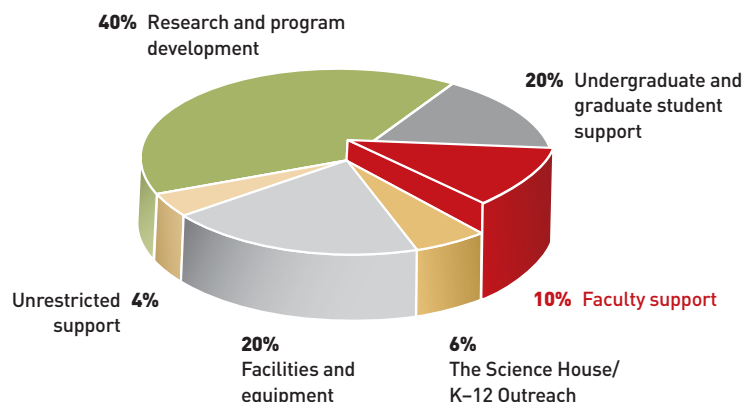
In response, NC Governor Mike Easley appointed a Hazardous Materials Task Force to examine current regulations for hazardous waste storage facilities, and recommend changes to tighten the rules governing these facilities, including legislation if needed, to fully protect the state's citizens and environment.

Viney Aneja is the only research scientist asked to participate on the task force, which includes representatives from emergency management, health departments, fire departments, emergency medical services, municipalities and other public service organizations.

Aneja's expertise with emissions, airborne pollutants and particulate matter was sought by the local and national news media immediately following the fire. □

# Achieve! The Campaign for NC State

Increasing resources to support faculty is an important objective of NC State's \$1 billion campaign. The article on page 22 highlights the need for professorships. At this time, PAMS is at 19 percent of its faculty support goal.



PAMS Campaign Goals	Endowment	Current Needs
<b>Undergraduate and graduate student support</b> \$10 million will double the current level of support, providing resources to compete for talented students and meet financial needs	\$ 6,500,000	\$ 3,500,000
<b>Faculty support</b> \$5 million will endow professorships to recruit and retain distinguished teaching and research faculty	5,000,000	
<b>The Science House/K-12 outreach</b> \$3 million will create an endowment to provide permanent support for The Science House, and fund current teacher training and student science programs	1,000,000	2,000,000
<b>Facilities and equipment</b> \$10 million will support modern instructional methods and technologies		10,000,000
<b>Unrestricted support</b> \$2 million in flexible, current gifts will allow us to respond to exciting opportunities, urgent needs and unexpected challenges		2,000,000
<b>Research and program development</b> \$20 million will enable us to conduct research and develop academic programs leading to discoveries and knowledge that enhance quality of life and stimulate economic development		20,000,000
<b>Total</b>	<b>\$12,500,000</b>	<b>\$37,500,000</b>
<b>PAMS Campaign Needs</b>	<b>\$50,000,000</b>	

## How to make a gift

You may remember how difficult it was to manage the expense of higher education. You may want to help today's students achieve their dreams.

The PAMS Foundation provides many ways to support students, faculty and programs of the College. Whether you want to contribute to an existing scholarship, support a departmental enhancement fund, make a memorial gift or consider support in other areas, our staff is available to help you explore the options.

### To support existing funds

To contribute to a scholarship, fellowship or other fund, fill out our secure, online gift form at [www.css.ncsu.edu/pams/](http://www.css.ncsu.edu/pams/) or mail a check to the NCSU Physical & Mathematical Sciences Foundation, Campus Box 8201, Raleigh, NC, 27695. Make checks payable to PAMS Foundation and write the name of the fund on the "notes" or "for" line.

If your employer provides matches for charitable donations, please send a completed matching gift form with your contribution.

There are many funds not mentioned in this issue of *Scope*, and several have specific designated uses. If you would like information on our various funds to help you decide the best fit for your support, please call us at 919-515-3462. For a list of funds, visit [www.pams.ncsu.edu/development/funds.php](http://www.pams.ncsu.edu/development/funds.php).

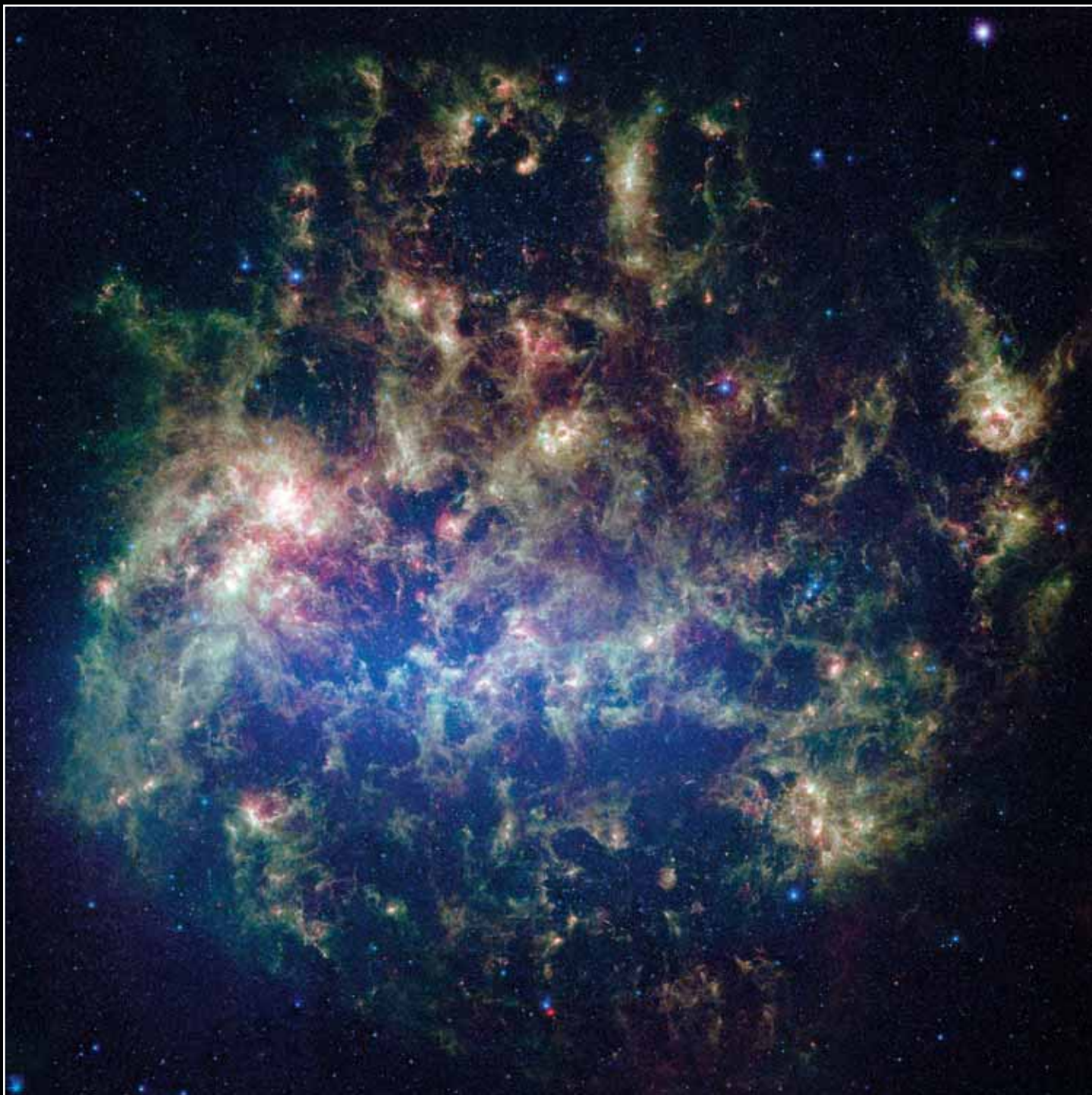
### To explore other options

If you have questions about gift planning, we can help you identify tax benefits, choose between permanent endowment vs. one-time support and explore estate planning or life-income options.

There are many ways to match your interests with specific College needs, and several possibilities for making your vision a reality. Whether using cash, appreciated stock, real estate or a bequest, we can help you find the best way to make the most of your gift.

Contact us today at 919-515-3462 or by e-mail at [pamsalumni@lists.ncsu.edu](mailto:pamsalumni@lists.ncsu.edu). □





COURTESY OF NASA/JPL-CALTECH/M. HEINER (ISTC) & THE SAGE LEGACY TEAM

## An explosive discovery

Physicists at NC State recently announced a surprising discovery—young stars can experience the same thermonuclear explosion thought to only happen to old stars.

It has long been believed that thermonuclear supernovae involved only stars that were several billion years old. However, the research team found evidence that younger stars have exploded in this way, leaving behind tell-tale remnants in the Large

Magellanic Cloud (shown above in infrared mosaic) and other young, star-forming galaxies. In fact, it appears to be common.

Because thermonuclear supernovae have been used to study the accelerating expansion of the universe, this discovery has far-reaching implications throughout astrophysics, including our understanding of the universe's expansion and the synthesis of certain elements, particularly iron.

The research team includes Professor Steve Reynolds and Associate Professor Kazimierz Borkowski of the Physics Department and Sean Hendrick (PhD '03 Physics), now an assistant professor of physics at Millersville University in Millersville, Penn.

The work involved use of the Chandra X-ray observatory in conjunction with NASA and the XMM-Newton satellite in cooperation with the European Space Agency. □